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I hereby certify that annexed is a true copy of the Provisional Specification as filed on 14 October 2003 with an application for Letters Patent number 528921 made by ARCHITECTURAL PROFILES LIMITED.

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PROVISIONAL SPECIFICATION

IMPROVEMENTS IN AND RELATING TO MULTIFOLD DOOR AND WINDOW  
ASSEMBLIES

We, **ARCHITECTURAL PROFILES LIMITED**, a New Zealand company, of  
19 Northpark Drive, Te Rapa, Hamilton New Zealand do hereby declare this  
invention to be described in the following statement:

PT043790055

## **IMPROVEMENTS IN AND RELATING TO MULTIFOLD DOOR AND WINDOW ASSEMBLIES**

### **Field of the Invention**

This invention relates to a multi-fold leaf joinery assemblies, i.e. folding door or window assemblies which have multiple door or window leaves that are pivotally inter-connected so that the leaves fold relative to each other in an open position.

### **Background of the Invention**

Multi-fold leaf assemblies, such as so called "bi-fold" door assembly, for example, suffer a number of problems.

The most significant problem is the scrubbing that occurs between the frame seal on the frame head or sill and seals on vertical edges of the leaves of the assembly. Scrubbing eventually results in worn seals which inevitably require replacement. It can also result in damage to the leaf.

Structural problems also exist with known arrangements. One of these is the provision of roller or bogey units on one side of an upper or lower leaf rail or at the top or bottom of a stile. Since these units are off-centre, distortion of the leaf tends to occur over time. The position of the bogey or roller unit also tends to adversely affect aesthetics of the assembly.

The roller or bogey units that are currently used work in conjunction with a track that is provided in the frame or as an attachment thereto. This allows the leaves to be wheeled or rolled along the track to allow them to fold relative to each other during opening and to unfold during closing. Tracks are prone to contamination from debris such as stones, grit and dust which tend to collect on or in the track and interfere with the movement of the bogey or roller unit. Apart from making operation of the assembly difficult, debris in the track or channel can damage the bogey or roller unit and significantly reduce the life span of the assembly.

Multi-fold leaf assemblies also present security problems when trying to maintain the leaves in any position apart from a fully closed position.

## Object of the Invention

It is an object of the present invention to overcome one or more disadvantages of known assemblies, or to at least provide the public with a useful choice.

Other objects of the invention will become apparent from the following description, which is given by way of example only.

## Summary of the Invention

Accordingly, in one aspect of the invention broadly provides a joinery bogey for a multi-fold joinery leaf assembly, the joinery bogey including a body adapted to travel along a track, a first side of the body having a pivot arm dependent therefrom for pivotal connection to at least one of the leaves, a second side of the body substantially opposite to the first side having a seal engaging wall segment which in use is in substantially continuous contact with a frame seal of a head or sill of the frame.

Preferably the bogey comprises part of a multi-fold joinery leaf assembly.

Preferably the body includes a wheel or roller to enable the body to move along the track.

Preferably the bogey is pivotally connected to one or more leaves and regions of each leaf adjacent to the wall segment are contoured or recessed such that the wall is substantially accommodated by each leaf when the leaf is in the closed position so that a substantially continuous planar surface is provided adjacent to the frame seal.

Preferably the wall segment has two vertical sides and two horizontal sides.

Preferably at least one horizontal side is disposed above the level of the frame seal in the sill or below the frame seal in the head of the frame.

Preferably the vertical sides are horizontally spaced from the pivot support such that edges of the leaf or leaves adjacent to the vertical sides move away from the relevant frame seal when the leaf or leaves are being opened.

In a further aspect the invention broadly provides a multi-fold, joinery leaf assembly having two or more door or window leaves, hinged together about a vertical axis and hingedly connected to a bogey unit adapted to travel along a track, the bogey including a seal contacting wall segment adapted to contact a frame seal of a head or sill of the frame in use, and each regions of the leaves adjacent to the bogey unit including a recess or contour adapted to accommodate the wall segment when the assembly is in a closed configuration.

Preferably the bogey includes a wheel or roller to enable the body to move along the track.

Preferably the bogey is pivotally connected to one or more leaves and regions of each leaf adjacent to the wall segment are contoured or recessed such that the wall is substantially accommodated by each leaf when the leaf is in the closed position so that a substantially continuous planar surface is provided adjacent to the frame seal.

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Preferably at least one horizontal side is disposed above the level of the frame seal in the sill or below the frame seal in the head of the frame.

Preferably the vertical sides are horizontally spaced from the pivot support such that edges of the leaf or leaves adjacent to the vertical sides move away from the relevant frame seal when the leaf or leaves are being opened.

In a further aspect the invention broadly provides a multi-fold, joinery leaf assembly of a kind having two or more window or door leaves hinged together about a vertical axis and a bogey unit pivotally connected to a corner region of at least one of the leaves.

Another aspect the invention broadly provides a multi-fold joinery leaf assembly having at least two pivotally connected joinery leaves, a mounting frame and a track provided in the base of the mounting frame, a bogey unit adapted to move along the track, and a bogey unit being provided in the base of one or more of the leaves such that the bogey supports the one or more leaves directly above the track.

In another aspect the invention broadly provides a joinery bogey for a multi-fold joinery leaf assembly, the bogey unit including  
a track movement means to allow the bogey to move along a track,  
5 a pivot assembly pivotally connecting a first stile or rail engaging arm to the bogey unit, the pivot assembly also pivotally connecting a second stile or rail engaging arm to the bogey unit, each stile or rail engaging arm being adapted to be attached to a stile or arm of a joinery leaf.

10 In another aspect the invention broadly provides a track assembly for a multi-fold joinery leaf installation having a frame member with a recess adapted to receive a track, the track being insertable and removable to and from the recess and having at least one wall defining a central cavity and two edges, at least one of the edges or the wall being adapted to support a bogey or carriage unit.

15 Preferably at least one edge includes a lip or bead providing a substantially convex surface.

Preferably the track is formed from a different material than the frame.

20 Preferably the track is formed from stainless steel.

In a further aspect the invention broadly provides a multi-fold joinery leaf track having at least one wall defining a central cavity and two edges, at least one of the edges being  
25 adapted to support a wheel or roller of a bogey or carriage unit such that the bogey or carriage unit in use travels across at least one edge.

Preferably the cavity is adapted to accommodate a guide member dependent from the bogey or carriage unit.

30 Preferably the cavity in use allows particular matter to fall therein so as to prevent the particular matter from interfering with movement of the bogey or carriage unit along a track.

Further aspects to the invention, which should be considered in all its novel aspects, may become apparent from the following description which is given by way of example only and with reference to the accompanying drawings.

## **Brief Description of the Drawings**

Figure 1 is a partial perspective view from below of two adjacent leaves of a folding door assembly in a closed position.

Figure 2 is a perspective view of a part of a bogey or carriage unit which is partially shown in Figure 1

Figure 3 is a partial perspective view of the exterior of the assembly of Figure 1 again shown in the closed position

Figure 4 is a partial perspective view of the interior of the assembly shown in Figure 3, in which part of the bogey unit may also be seen.

Figure 5 is a side elevation and cross section of the lower or bottom track assembly of the folding door assembly of the preceding figures.

Figure 6 is a side elevation and cross section of the top track or rail assembly of the folding door assembly of the preceding figures

Figure 7 is a perspective view of the assembly of Figure 1 in a closed configuration, but with the structure of the joinery leaves removed.

Figure 8 is a further perspective view of the construction shown in Figure 7, but in a partly open position.

Figure 9 is a further perspective view of the construction of Figures 7 and 8 in a partially open position which is more open than that shown in Figure 8.

Figure 10 is a partial perspective view of the construction of Figures 7 to 9, but in a fully open position.

Figure 11 is a partial perspective view from below of an alternative embodiment of a multi-folding joinery leaf assembly in which the edges of two adjacent leaves are shown disposed in the closed position in which the edges abut each other, such as may occur at an even leaf configuration of a multi-fold assembly.

Figure 12 is a partial perspective view from below of a further alternative embodiment of the invention showing an edge of a leaf in a closed position in which it abuts a stationary member such as a frame member or mullion. This configuration is one which typically occurs in an odd and even leaf multi-fold assembly.

Figure 13 is a diagrammatic partial plan view of the assembly of Figure 1 showing a sequential opening of the hingedly connected leaf members.

## Detailed Description

The invention will now be described with reference to a number of preferred embodiments.

5 As a person skilled in the relevant art will appreciate, reference in this document to leaves refers to the folding elements such as panels (which may be glazed) including door panels or windows, for example. References in this document to multi-fold leaf assemblies include assemblies such as those commonly referred to as bi-fold door assemblies, i.e. 10 those having two or more folding leaves. When these assemblies are in the closed position, the leaves are aligned so as to be parallel to the plane of the building opening in which they are disposed. In an open position or configuration the panels are disposed at an angle to the plane of the opening. In a fully open position the leaves are substantially perpendicular to the plane of the opening.

15 Referring to Figure 1, two adjacent leaves, generally referenced 30 and 31 are shown. The leaf 30 has a stile or mullion 30a and leaf 31 has a stile or mullion 31a. Although the assembly could be suspended from a track in the head of the frame, the arrangement shown in Figure 1 is preferred and that is further described below.

20 As illustrated in Figure 1, a bogey unit which is general reference 2 is provided at the base of stiles 30a and 31a or at the inner edges of lower rails 30b and 31b of the adjacent leaves. Thus the bogey unit 2 can be provided as an integral part of the leaf structure, or can be provided as a completely separate component. Also, as illustrated in Figures 7 to 25 10, the bogey unit may be provided as a structural unit having mounting arms for engagement with one or both of the stiles or rails of each leaf.

The bogey unit preferably has a frame or carriage which may be provided as a unitary member, for example being cast or moulded. The frame generally includes elongate 30 portions 14 and 15 and a pivot arm 8 which supports a pivot base 5. Mounted on the frame are one or more wheels or rollers 4 mounted relative to the frame by bearings 50. Guide rollers 11 may also be provided to assist guiding the bogey unit in a track as will be further described below.

35 Referring to Figure 1, the pivot base 5 is provided on a pivot arm 8, which extends outwardly from the frame of the bogey unit. Arms 17, 18, which are dependant from the



leaves 30, 31, co-operatively engage with the pivot support 5 to form a barrel in which pin 19 is inserted. Together these components form the pivotal (or hinged) connection between the bogey unit and the adjacent leaves.

5 A wall segment 6 is also mounted dependent from the frame of the bogey unit such that it extends parallel to the bogey unit, i.e. parallel to the frame and the plane of the opening in which the unit is disposed in use. The wall segment 6 will contact a frame seal on the sill and the head of the frame, simply sliding along the seal in use as the assembly is opened  
10 or closed. This occurs because the wall segment remains stationary relative to the frame of the bogey unit. This is seen more clearly in Figures 7 to 10.

The lower parts of the stiles (or mullions) and the rails of the leaf members are recessed, apertured or otherwise formed so as to accommodate the wall segment 6. Seals 20 are  
15 provided on the edges of the leaves so that sealing contact is made with the edges of wall segment 6 when the assembly is in the closed position, as can be seen in Figure 4.

In Figure 5 the sill construction is shown in cross section for the preferred embodiment. The frame part 63 that provides the sill includes the rail assembly generally referenced 64  
20 which includes a track or channel 60 in a cavity 61 having upper edges that are rolled to form lips 62 and 63 on which the wheels 4 move in use.

The wheels or rollers 4 have a concave outer surface which engages with lips 62 and 63 to assist the rollers to follow the lips 62 and 63 of the track in use. The guide roller 11  
25 rests within an upper part of the cavity 61 of the track to provide further lateral support which prevents the bogey from becoming disengaged or derailed from the track.

The cavity 61 provided in the track allows debris, especially particulate matter such as stones, dirt and dust, to collect in the base of the channel. As can be seen, the bogey unit  
30 rests some distance above the base, so that debris is very unlikely to interfere with the movement of the bogey unit along the track.

The frame 63 may be constructed from a variety of different materials. As illustrated in Figure 5, the preferred form of the sill is an extrusion such as an aluminium extrusion and  
35 the frame 64 on which the multi-fold assembly is mounted includes the track 60 which is advantageously replaceable within the frame. This allows the track to be made of a

different material from that of the frame. In the preferred embodiment, a hard material is used, most preferably stainless steel to form the track. Stainless steel has the advantage of a much longer service life and provides greater strength to the frame member. Because it is replaceable, the track can be removed when it is worn. The relatively high cost of the stainless track is only incurred in a small part of the frame, which is an additional advantage.

The bogey unit sits directly below the leaf that it supports and in turn rests directly on top of the track 60. Therefore, the significant weight of the leaf or leaves that the bogey unit supports bears directly upon the track and thus upon the frame. This differs significantly from existing constructions where the bogey unit is frequently attached to the side of an upper or lower rail of the leaf meaning that the weight of the leaf or leaves is not directly aligned with the track. Accordingly, distortion can occur in the leaf or frame. The alignment of forces realised with the present invention overcomes this problem.

The folding door assembly 1 preferably further includes an overhead rail. Figure 6 illustrates an overhead rail of the preferred embodiment. The overhead rail 17 preferably aligns with the bottom positioned track 60 so that the rail 70 and track 60 support the leaves 30, 31 in a substantially vertical alignment.

Turning to Figures 7 to 10, an embodiment of the invention is shown in which a structural unit is provided including a bogey or carriage and also effectively including the lower (or upper) corner or corners of a leaf or leaves that the bogey unit supports in use. These hingedly connected corner assemblies include spigots 41 to 44 about which rails or stiles of the leaves can be located in order to create the required multi-fold leaf structure. Therefore, the invention also provides a structural unit which may be used to create a multi-fold leaf assembly. Although the structural unit shown in Figures 7 to 10 shows a structural unit for two leaf corners which are hingedly interconnected about a bogey unit, those skilled in the art will appreciate that the structural unit is also applicable to the other embodiments referred to in this document, including for example the embodiments shown in Figures 11 and 12.

The embodiment shown in Figures 7 to 10 has the advantage that it facilitates construction of a complete multi-leaf assembly from extruded aluminium components. Furthermore, the extruded aluminium components themselves have a grain and the assembly of extruded components using the structural unit shown in Figures 7 to 10 can

provide a multi-leaf assembly which has a desirable aesthetic appearance which compares favourably with timber joinery products. This is because the grain of timber products (for example, a glazed timber multi-fold door assembly) will have stiles and rails, having a grain with a distinctive appearance. The present invention allows that appearance to be imitated, at least to a certain extent, using aluminium fabrication.

Referring now to Figure 11, another embodiment of the invention is shown. Like features between the embodiment shown in Figure 11 (and that of Figure 12) which are the same as those of the embodiments discussed above and have the same referenced numerals. The construction shown in Figure 11 shows the abutting edges of two leaves in a multi-leaf construction which has an even number of leaves. Therefore the two abutting leaves shown in Figure 11 may be typically provided at the centre of a multi-leaf installation, the installation being opened by a user pushing the abutting edges of the leaves 80 and 81 apart so that the bogey units travel away from each other. As can be seen in Figure 11, the bogey or carriage units have only two wheels each rather than 4, however, two guide rollers 11 are provided to assist correct retention of the bogey relative to the track. Each bogey is pivotally (i.e. hingedly) connected to the edge of its relevant leaf. Again, each bogey has a wall segment 6 that in use remains in contact with the frame seal along the sill or head of the frame.

In Figure 12, the bogey which is hingedly connected to the edge of a leaf 82 is shown. The leaf abuts a stationary frame member 83, which is a situation that typically occurs in a multi-fold assembly with an odd number of leaves, i.e. a single leaf may abut a stationary frame member such as upright 83. Again, the wall segment 6 remains in contact with a frame seal provided at the head or sill of the frame.

In use, the wall segment 6 is adapted to co-operate with seals 20 retained in retaining grooves 21 in the sill members of the leaves 30, 31 when in a closed configuration to provide a weather seal i.e. to assist prevention of draughts/air/wind driven water movement through the multi-fold assembly 1. The seals are positioned around the sides and top edges of the wall segment 6. The seals 20 could include air seals or compression seals as would be known in the art. A further preferred option is that the seals 20 may include barbs adapted to engage with ribs of further seals on the wall 6 when the leaves 30, 31 are in a closed configuration. Thus the wall 6 effectively fills a recess provided in each panel member in the vicinity of the frame seal along the sill and head of the frame.

The outer surface of wall segment 6 thus provides a surface which contacts the frame seals along the head and sill of the frame when the assembly is in the closed position.

As shown in figure 13, the leaf edges that contact the frame seals are off-set from the point of rotation of the leaves. When the leaves are being moved from a closed position to an open position their edges move away from the frame seals at points 100. As can be seen, the leaves move away from the seals and do not rotate toward the seals, so there is no scrubbing.

This means that seal-to-seal friction and wear from scrubbing is eliminated. This has the advantage of reducing the need to replace seals as frequently as currently required.

Furthermore the reduction of seal/seal friction and/or scrubbing means that seals are more likely to function in their correct position. Damaged or worn seals have a tendency to bunch or sit in an undesirable or irregular position. This can allow air flow or draughts through the gap, and cause further damage to the seals. The present invention provides a means of extending the life of the seals so that these problems may be avoided.

The current invention also provides a means of improving security and locking of a folding door assembly. The invention incorporates part of a bogey at the internal seal that runs parallel to the frame, such as wall segment 6 in the current example. This feature enables the fitting of lockable security bolts (for example bolt 85 in figure 4) to the exterior surface of wall 6 i.e. the surface that faces interiorly toward the frame in use. The lockable bolt may be a slidable bolt which is slideable parallel to the stile and which can be slid into one or more apertures provided in the frame. Alternative locking devices that engage frictionally with the frame may also be provided. This enables the bogey to be locked to the frame at various positions along the length of the sill for example. This in turn means that the leaves can be securely locked at intermediate positions in the opening process (Figures 7 to 10) which allows ventilation with security.

Wherein the foregoing description reference has been made to specific components or integers of the invention having known equivalents then such equivalents are herein incorporated as if individually set forth.

Although this invention has been described by way of example and with reference to possible embodiments thereof, it is to be understood that modifications or improvements may be made thereto without departing from the scope of the invention.

**ARCHITECTURAL PROFILES LIMITED**

By its Attorneys

**BALDWIN SHELSTON WATERS**

A handwritten signature in dark ink, appearing to be 'BSW', is written above a horizontal line.

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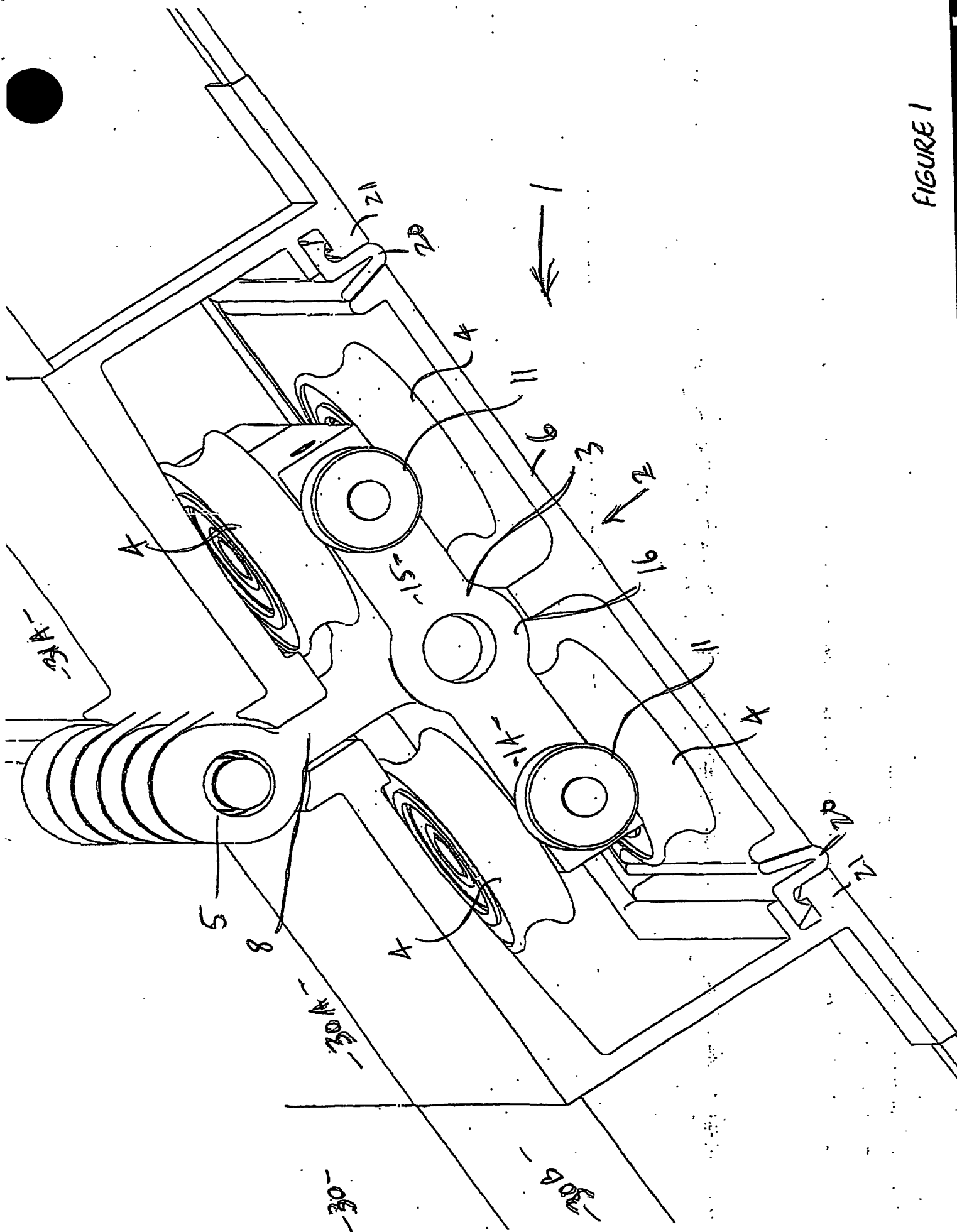


FIGURE 1

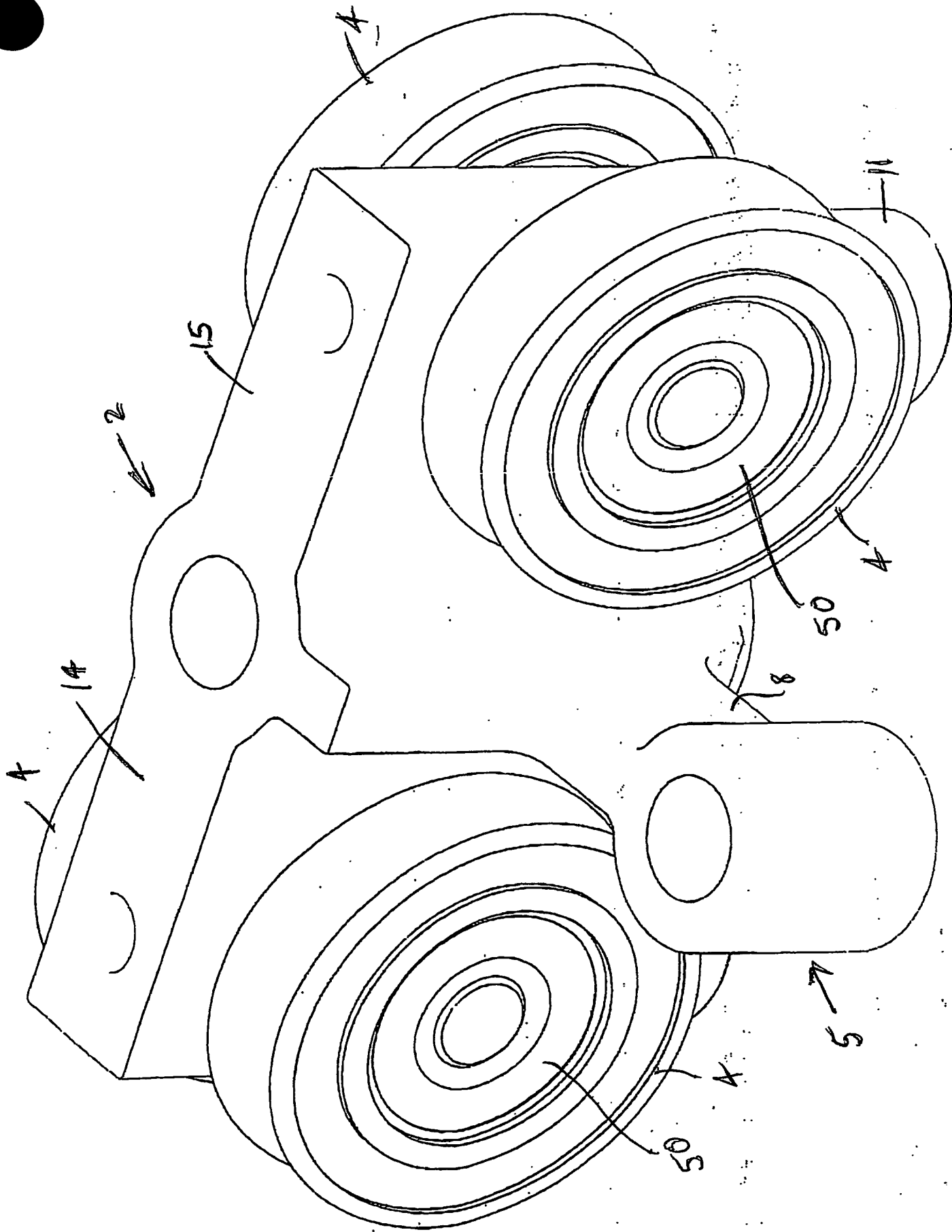


FIGURE 2.

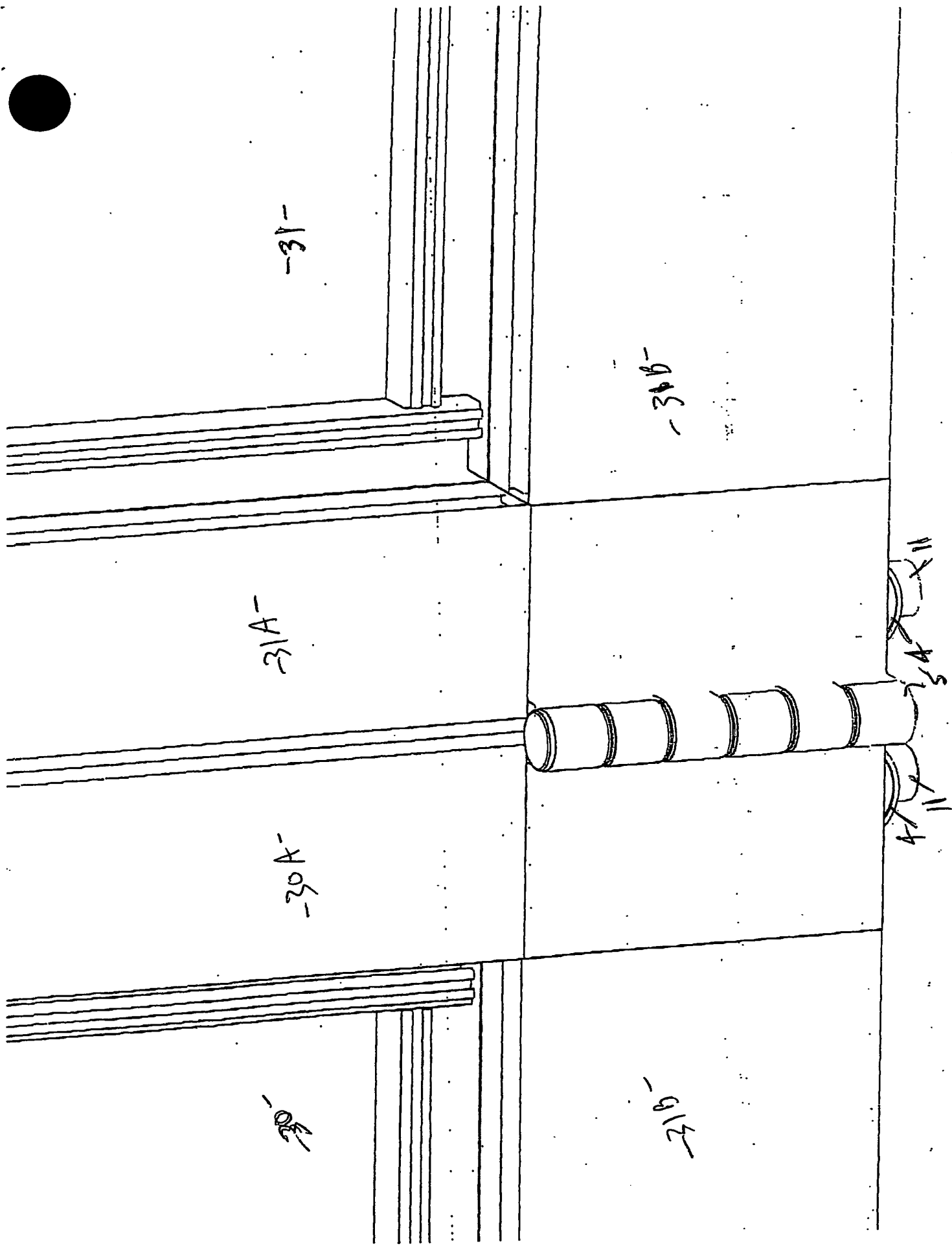
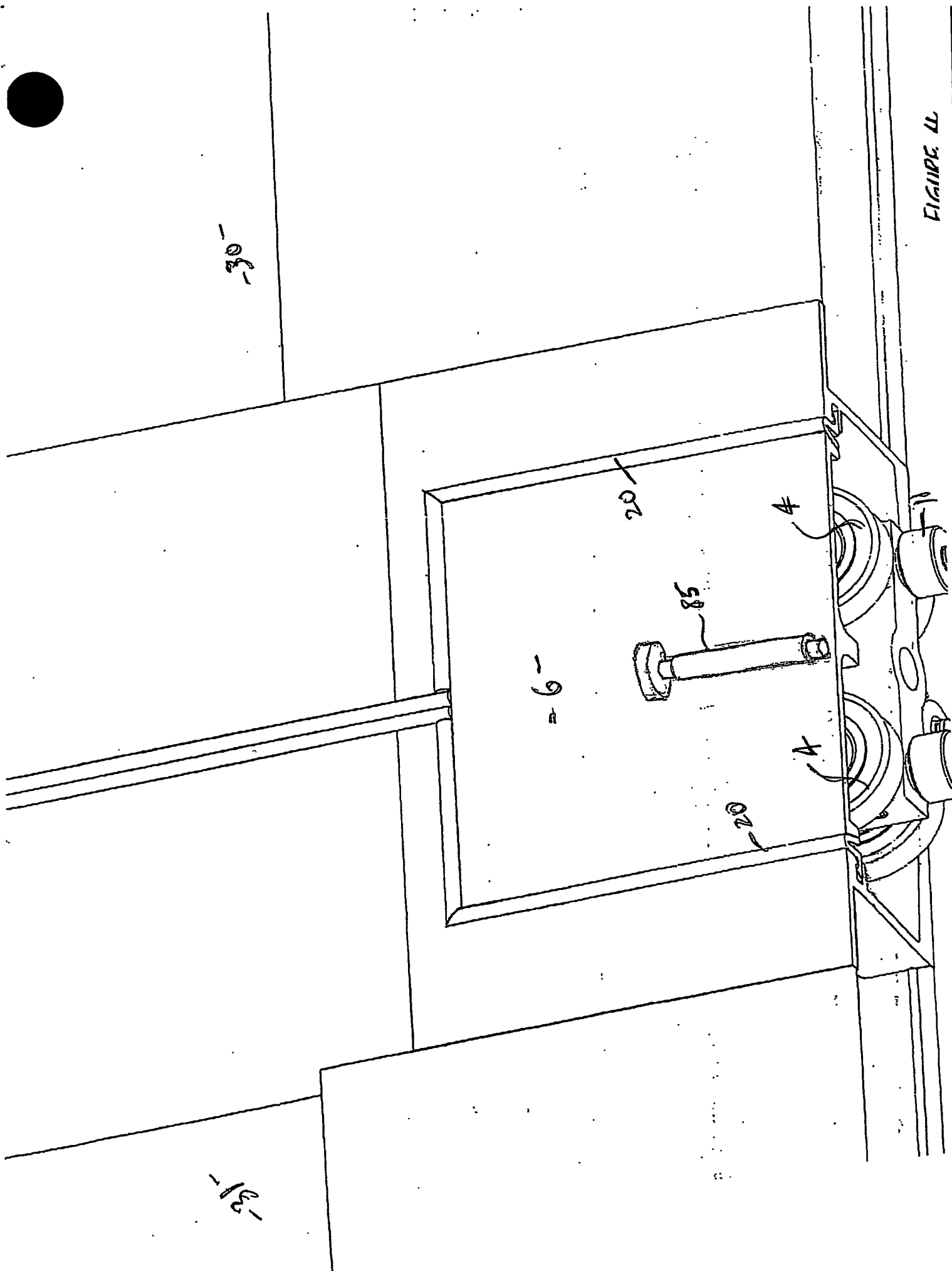
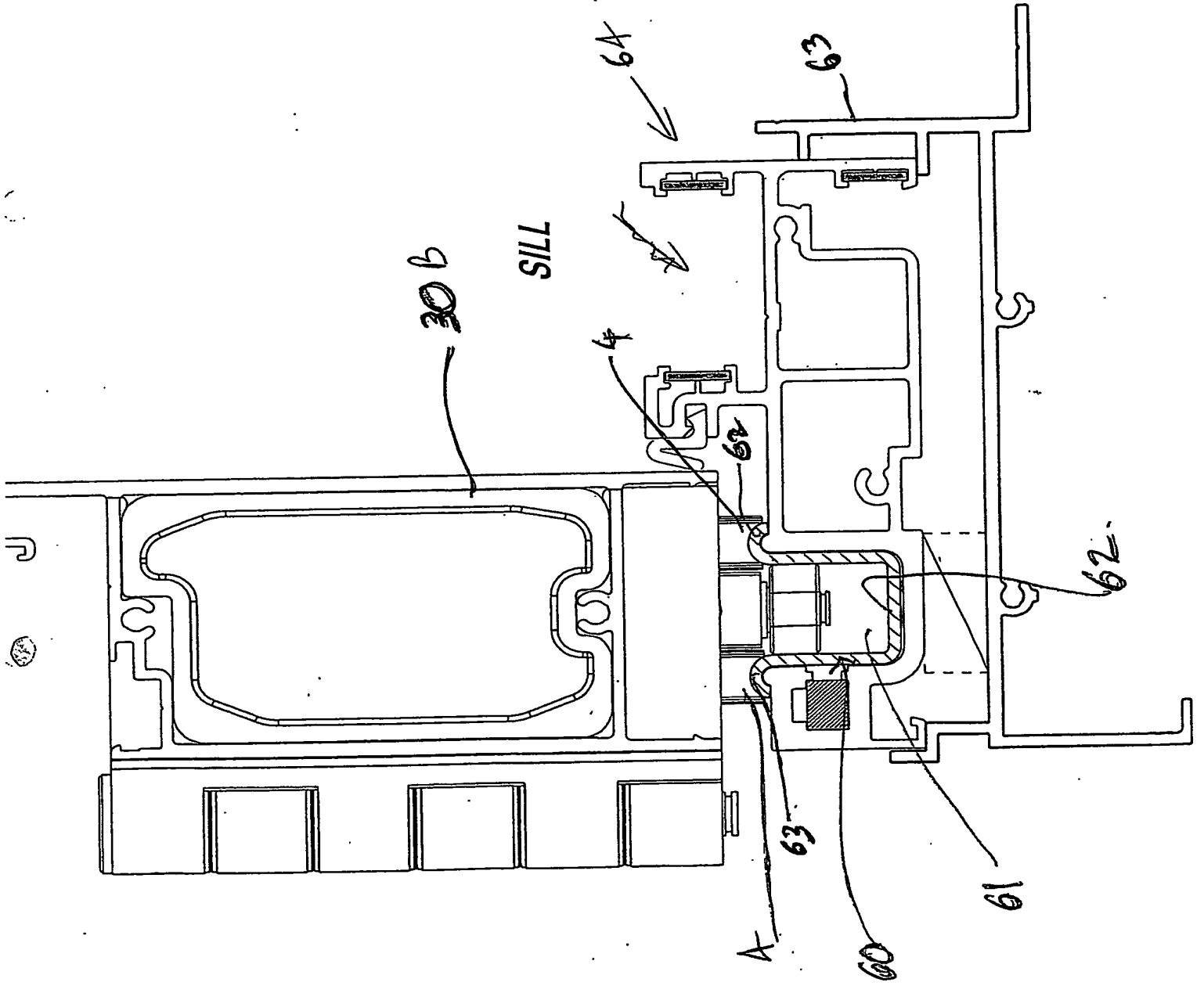


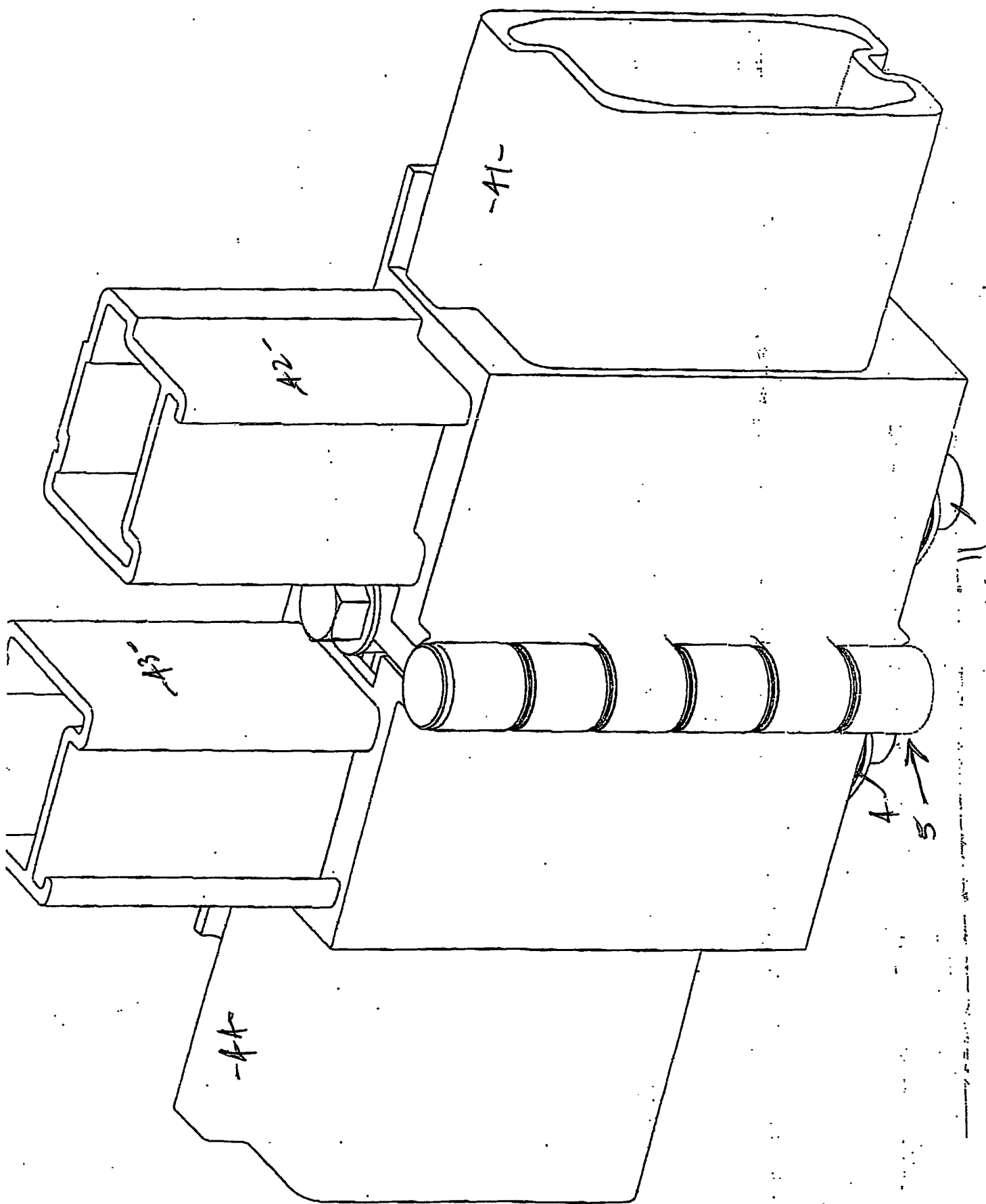
FIGURE 2



FIGURE 11







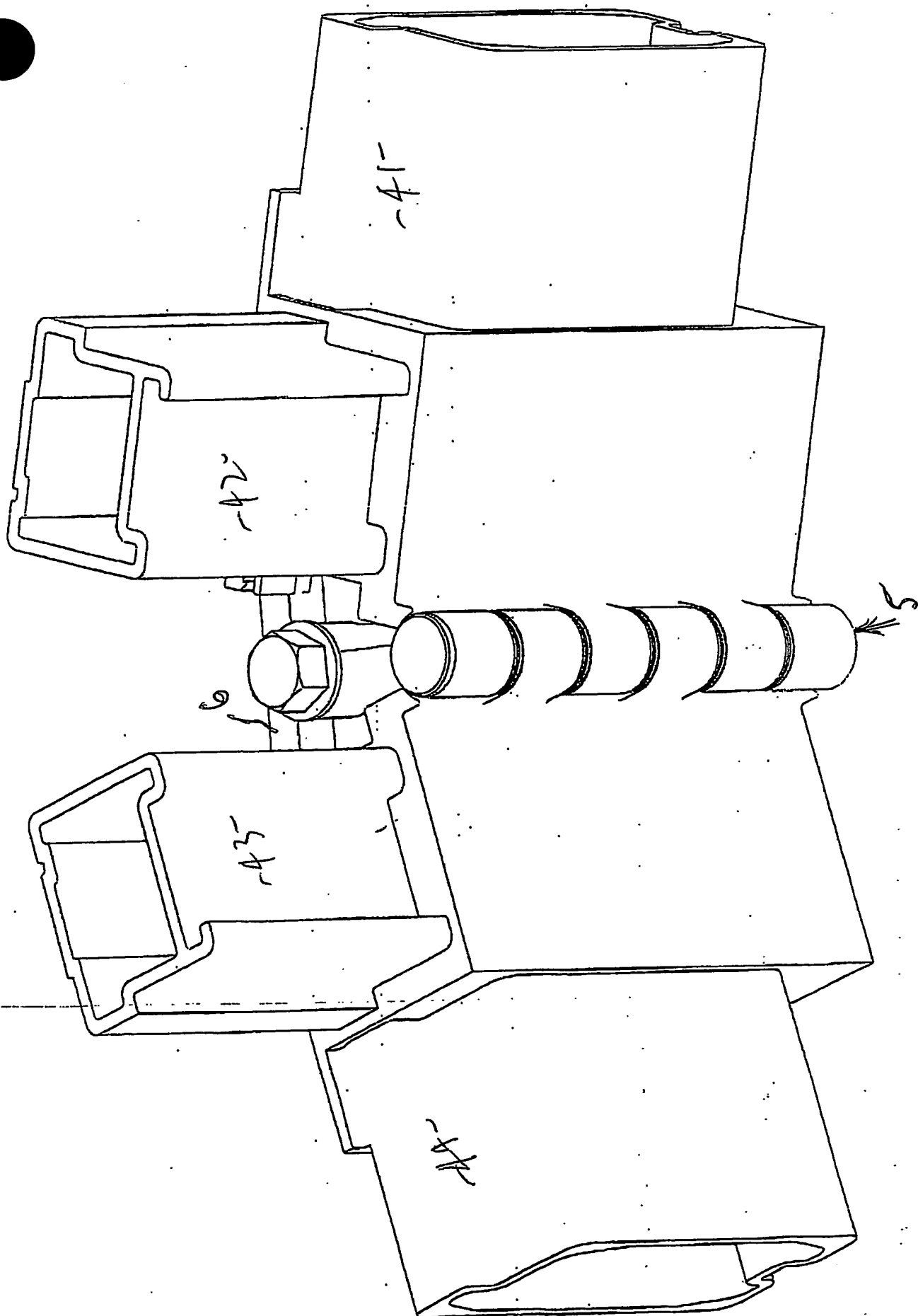
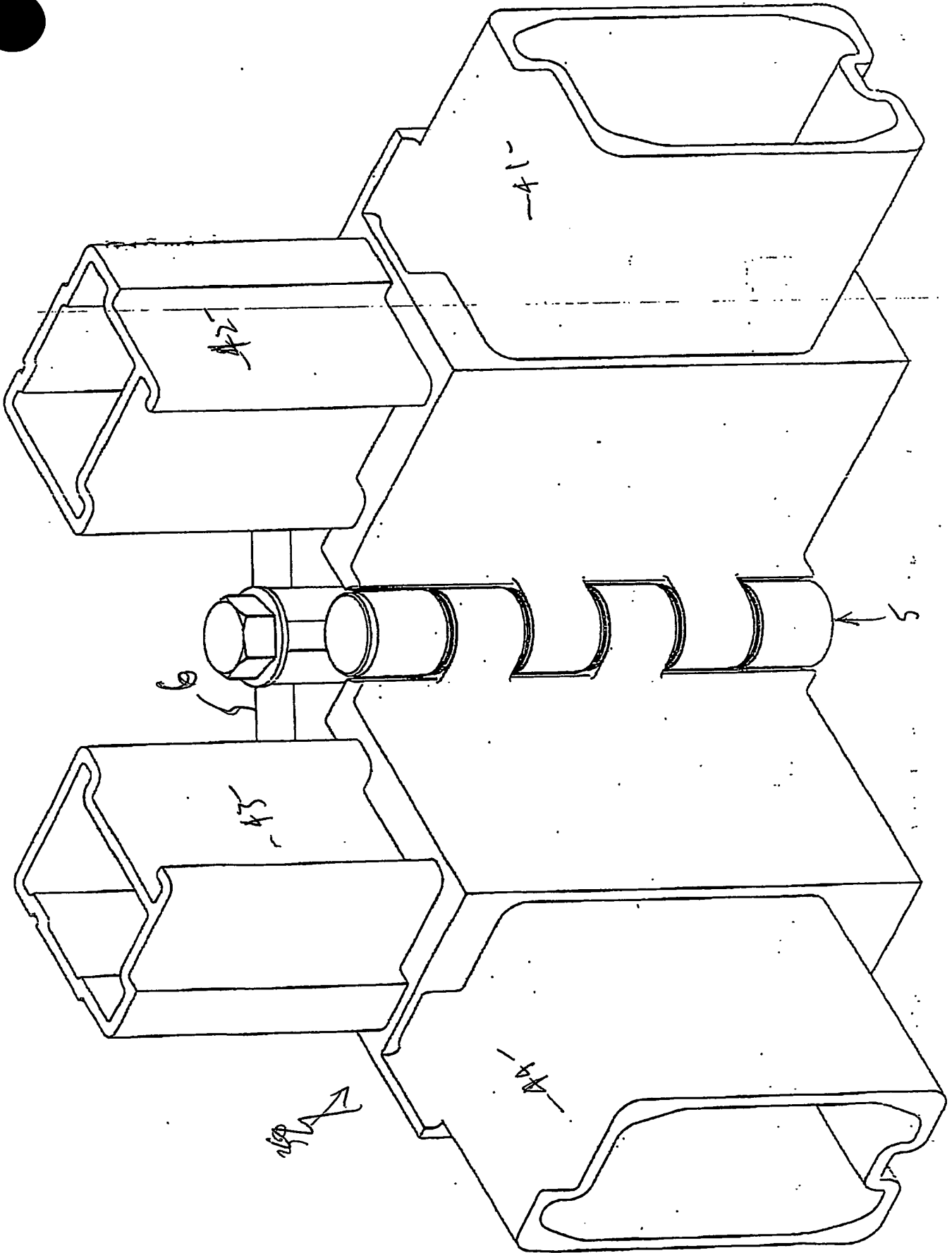


FIGURE 8



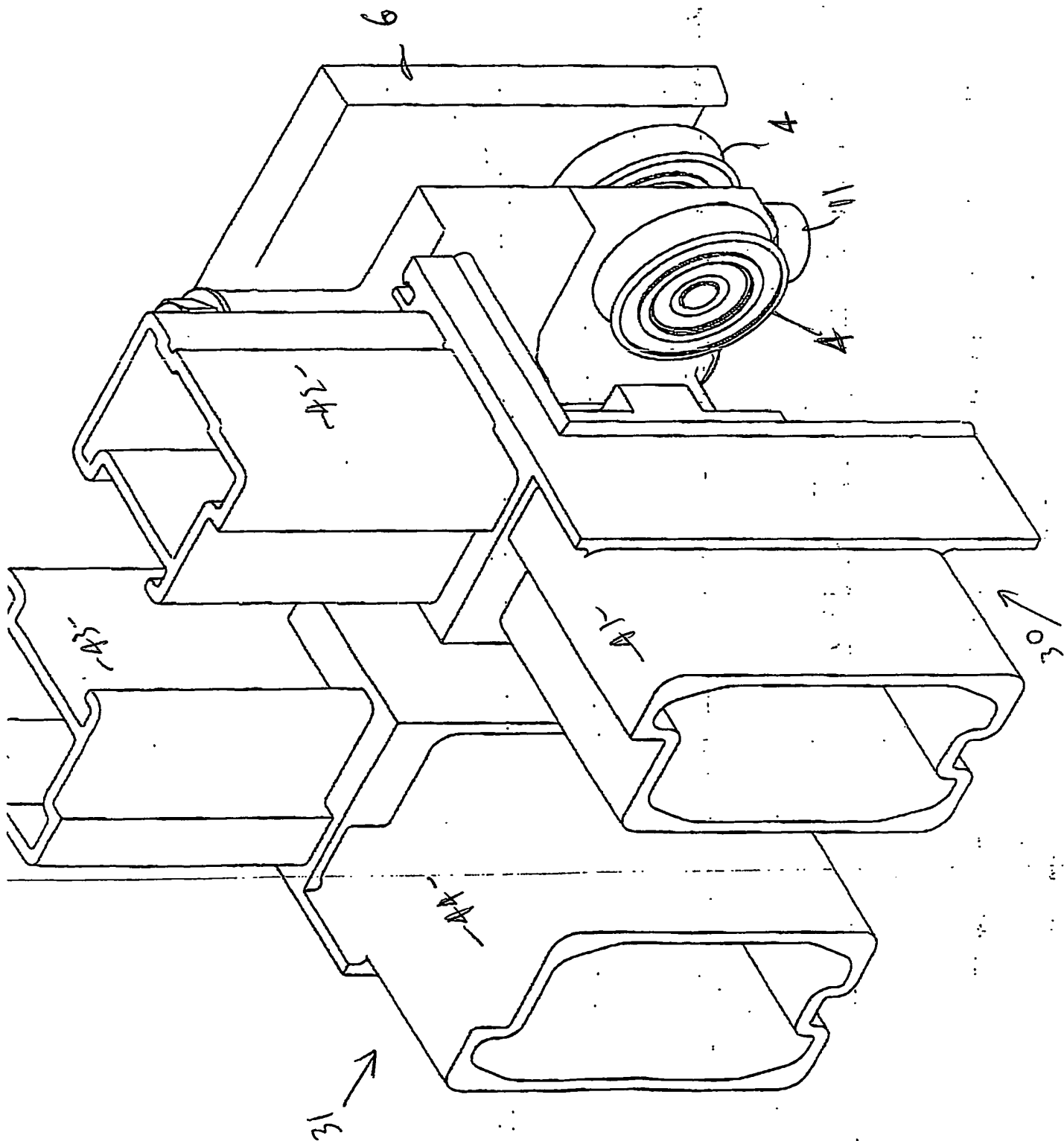


FIGURE 10

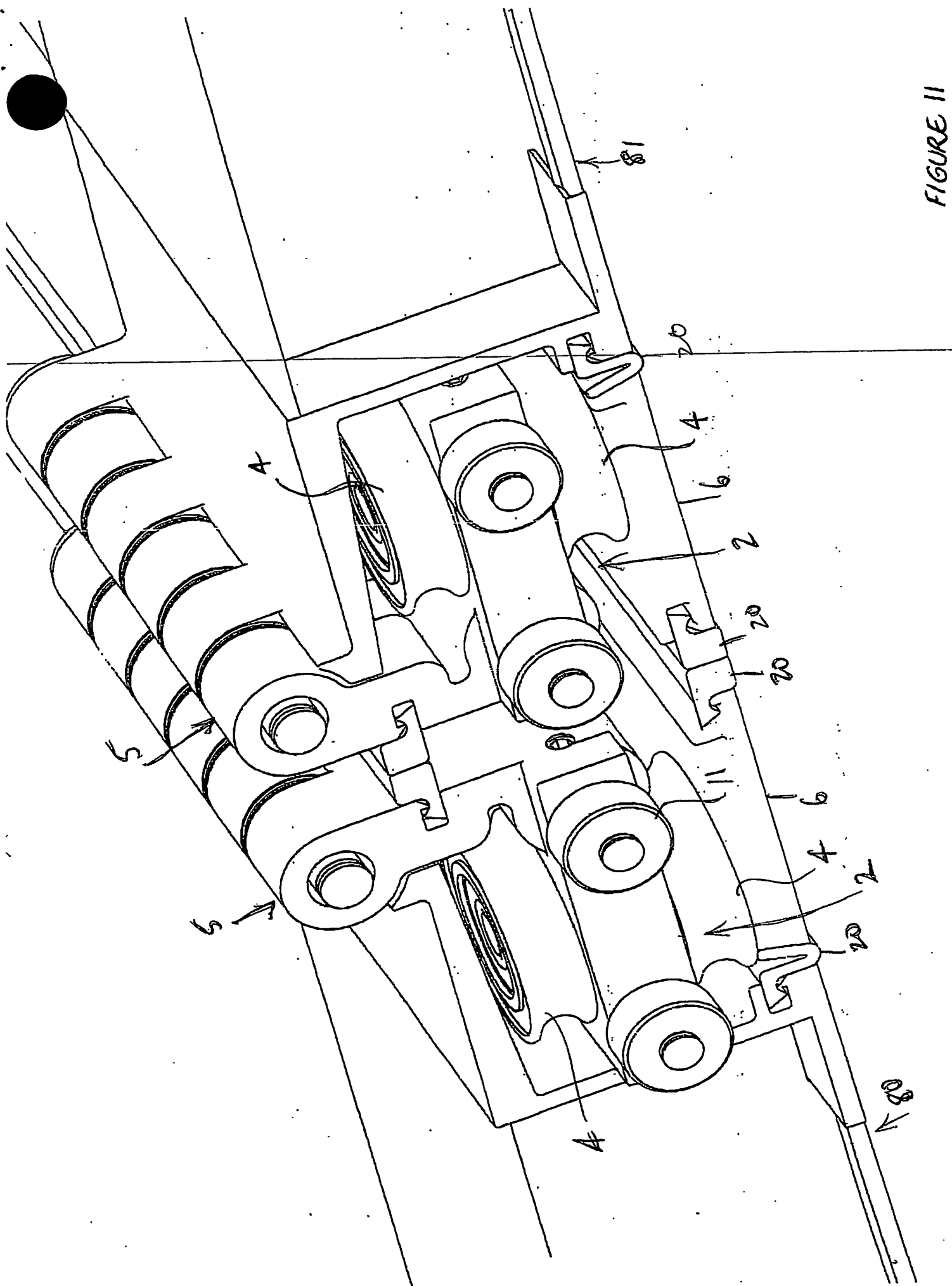
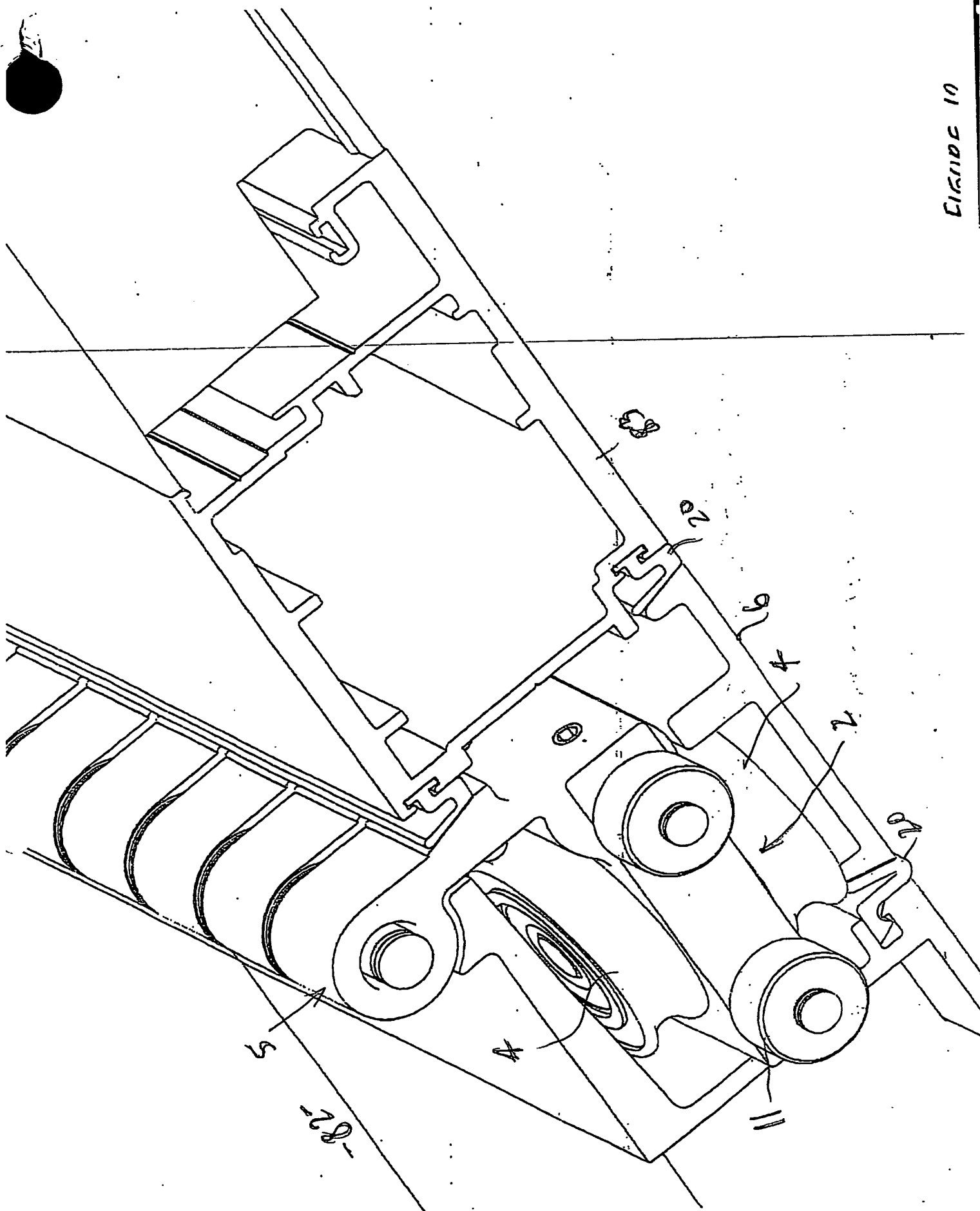


FIGURE 11





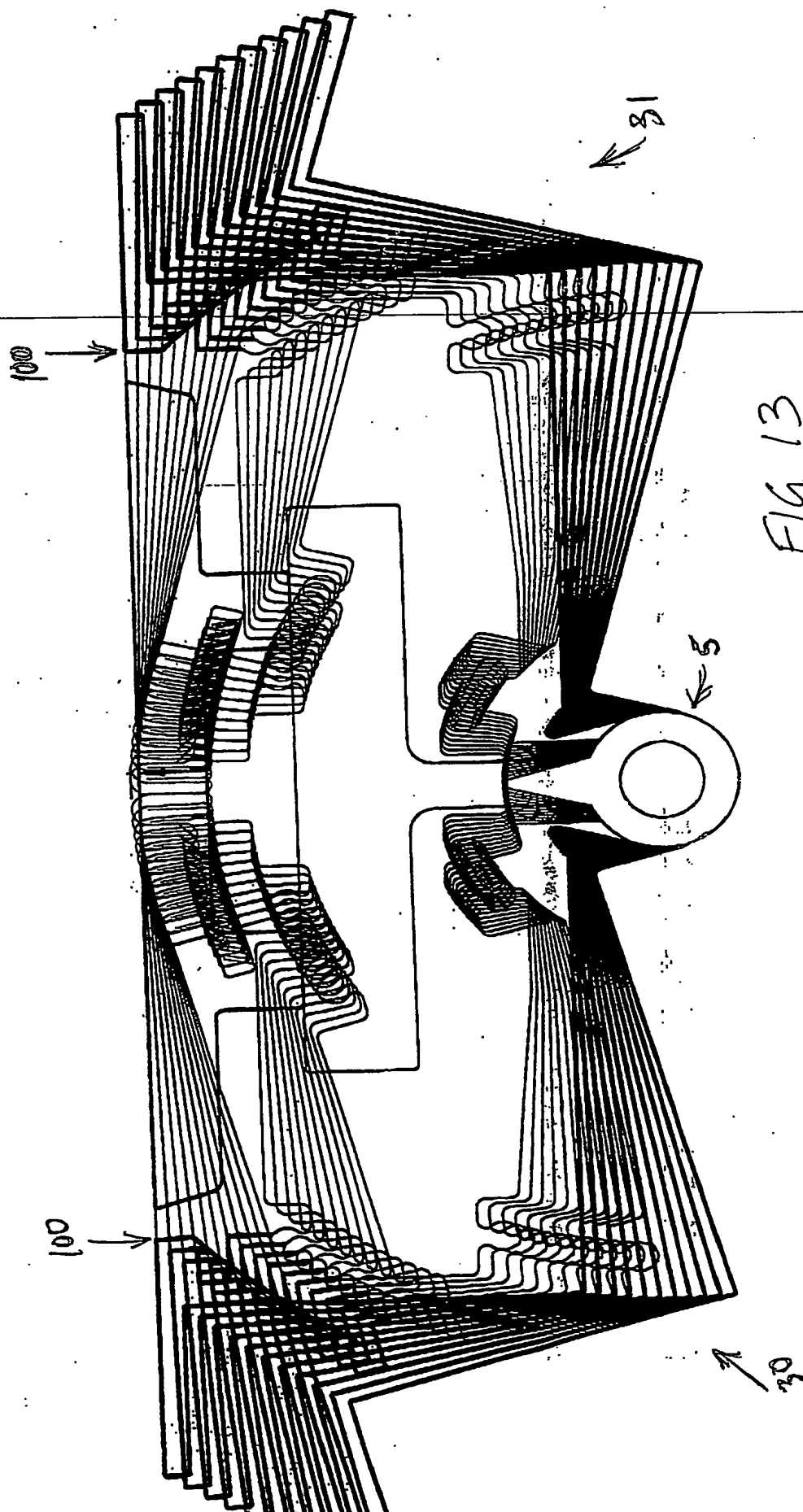


FIG 13

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